

10 May 2012

Memo to: ABoVE Science Definition Team

From: Dan Hayes and Eric Kasischke, Co-Chairs

Subject: Summary of Outcomes from 1st ABoVE Science Definition Team Meeting , La Jolla, CA, 2-3 May 2013

STD Members Attending: Natalie Boelman, Steve Colt, Josh Fisher, Scott Goetz, Peter Griffith, Guido Grosse, Forrest Hall, Bob Harriss, Jeremy Karchut, Libby Larson, Michelle Mack, Dave McGuire, Juha Metsaranta, Chip Miller, Mike Rawlins, Rob Streigl, Matthew Sturm, Colm Sweeney, Stan Wullschleger

Absent: Sharon Billings, Ruth Varner

During the first session on Thursday afternoon (May 2), Diane Wickland provided a review of the NASA charge to the ABoVE Science Definition Team. She then reviewed NASA's vision for ABoVE and identified key "guideposts" for the SDT to keep in mind during the development of the ABoVE Concise Experiment Plan (ACEP). Finally, Diane provided a notional outline for the ACEP, which is included as Attachment 1.

The goal for the first ABoVE SDT meeting was to begin discussing and developing the compelling rationale explaining the scientific and societal importance of ABoVE. This goal focuses on Chapter 2 of the ACEP (see Attachment 1):

2. Science Question(s) (2-4 pages)

- **Present overarching science question or/or top-tier science questions and explain them in some detail (e.g. paragraph)**
- **Present the and explain the Vulnerability framework OR whatever "final integrating figure" we have**
- **Explain how these will address the compelling imperative for an Arctic-boreal vulnerability study ("Compelling Rationale")**

For the rest of Thursday afternoon, the SDT continued the "Big Thing" discussion initiated during the 3rd SDT Telecon of 17 April 2013. This discussion focused both on ecosystem science as well as on societal impacts. During this discussion, three common threads emerged: (1) ABoVE needed to develop a conceptual framework that clearly linked the research on ecosystem science with the societal relevance of this research; (2) that the conceptual framework provided in Collins et al. (2011) for social-ecological research may be highly appropriate for ABoVE; and (3) that a vulnerability framework provides the basis for studying factors driving ecosystem changes in the Arctic-Boreal Region (ABR), as well as the changes to the services these ecosystems provide.

Based on these discussion, Co-Chairs Dan Hayes and Eric Kasischke worked on developing a conceptual “Vulnerability Framework” for ABoVE, which is presented in Figure 1 at the end of this memo¹. The key components of this framework include:

- A. The primary external drivers of changes to terrestrial ecosystems in the ABR include global-scale climate forcing and regional-scale, natural disturbances. In some areas, anthropogenic disturbances may be important, but only at landscape to sub-regional scales.
- B. There are four questions related to understanding and quantifying vulnerability that will be addressed during ABoVE:
 1. *In what ways are ecosystems changing?*
 2. *Why are ecosystems changing?*
 3. *How are ecosystem services affected?*
 4. *How is society responding to changes?*
- C. The linkages between these questions involve understanding the **Drivers** of ecosystem changes, the **Impacts** that ecosystem changes have on ecosystem services, how changes to ecosystem services **Impact** society as well as **Feedbacks** to drivers of ecosystem changes, and how **Responses** of society to changes in ecosystem services affect drivers of change.

The SDT next discussed the development of an overarching question for ABoVE based on a suggestion put forward by Co-Chair Eric Kasischke. Based on this discussion, the following overarching science question was developed:

How vulnerable and resilient are ecosystems and society to environmental change in Arctic and boreal regions?

Based upon the overarching science question, plus the four questions presented within the Vulnerability Framework, the objectives for ABoVE were next discussed by the SDT. The following two draft objectives were agreed upon by the SDT:

1. ***Quantify and understand multi-temporal dimensions of vulnerability at landscape to regional scales in the ABR.***
2. ***Improve approaches to measure, model, and predict changes that are occurring to Arctic and boreal terrestrial ecosystems and the services they provide.***

¹ The framework, questions, and objectives that were developed during the 1st ABoVE SDT Meeting should not be considered to be the final versions, but as starting points for subsequent discussions by the SDT.

The SDT agreed that together the Vulnerability Framework, the Overarching Science question, and the four questions presented in Figure 1 provide the compelling rationale needed to explain the scientific and societal importance of ABoVE. Based on this conclusion, the SDT next discussed the key points that needed to be addressed in a discussion of the importance of each question. These key points provide the content for the paragraphs that need to be written as part of Chapter 2 of the ACEP.

The SDT agreed that individual members will work on developing a single paragraph discussing the importance of each question, and that these paragraphs will be discussed during a teleconference that will be scheduled prior to the 2nd STD Meeting in Fairbanks in early July. During the meeting, several people agreed to lead the groups assigned to each question, and some members volunteered to serve on specific groups. Co-Chairs Dan and Eric would like all SDT members to participate in this exercise, and have assigned SDT members to specific groups. There will be a separate e-mail detailing this assignment, coming soon.

The SDT then discussed the key ecosystem services that would be addressed by ABoVE research. The following preliminary list was developed:

- Supporting Services
 - Permafrost, snow, and ice for infrastructure support and transportation
- Provisioning Services
 - Subsistence resources - Animals, plants, fiber, fuel
 - Animals, plants, fiber, fuel
 - Freshwater resources
- Regulating Services
 - Climate regulation (GHG, surface albedo)
 - Exports to coastal oceans (water, DOM, sediment)
 - Flood control
 - Disease control
 - Water purification
- Cultural Services
 - Subsistence activities
 - Tourism
 - Recreation
 - Aesthetics and spiritual

The SDT discussed ways in which we can further refine the list of “Big Things” that would be addressed during ABoVE in order to identify the major themes for ABoVE. One way to do this is to expand the “Big Thing” each one of us has identified to include the four questions contained in Figure 1. There will be a separate e-mail detailing this assignment, coming soon. When everyone provides their examples, they will be compiled and discussed during one of the SDT teleconferences prior to the 2nd SDT meeting.

Finally, a smaller group formed at the end of the meeting (and is holding follow-on e-mail communications) that has charged themselves with exploring the opportunities and constraints that will affect the ABoVE field campaign experimental design. This group will be working over the next several weeks gathering information on existing infrastructure, field sites and other relevant programs and activities in the domain, so that arrive at the July ABoVE meeting prepared to tackle experiment design armed with relevant data.

Notional Outline for ABoVE Concise Experimental Plan (Short Version)

1. Introduction
 2. Science Question(s)
 3. Second tier science questions or themes for ABoVE
 4. Overall Research Approach / Strategy (Top-level description of how we will address the ABoVE questions)
 5. Research approach by science question / theme (optional?? Or combine with #3. above
→ It is possible we might want to have a chapter here to roll up / integrate the “requirements” that come out in each of the science question / theme sections above
 6. Role of Remote Sensing (or could be so well integrated in the sections above it is unnecessary)
 7. Scientific interactions and partnerships with other projects, studies, organizations (OR could be folded into implementation section below)
 8. Implementation Strategy / Top-level Requirements
 9. Concluding Chapter (optional?)
- References
Appendices (optional)

Figure 1. Research Framework for ABoVE.

